

## ***Elastic Transformations within the Production of Knowledge through Art and Design***

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### **Biography**

Bettina Bruder studied Communication Design in Germany and received her MFA at Parsons School of Design, NYC. Currently, she works as an associate professor at the University of Applied Sciences in Vorarlberg, Austria. Before her PhD at UNSW in Art & Design, she worked as Senior Art Director for global corporations. This cross-disciplinary experience informed her design practice where she explored the potential for change within human understanding through the concept of elasticity. Her objective is the development of critical and sensitive articulations, which are elaborated through practice-based explorations, performances, artefacts and installations.

### **Abstract**

On the basis of 'situated knowledges' (Haraway, 1988) I argue that research and education in art and design may trigger a shift in conventional ways of knowledge production. On the one side, traditional approaches in knowledge making are guided by aspects of economic efficiency, convenience and scientific rationality privileging a certain kind of cultural development that rules out potentials for differently informed advancements. On the other side, the intricacy of current challenges that human kind is facing in the form of 'wicked problems' (Rittel and Webber, 1973) requires alter-native approaches different than established research agendas driven by financial, administrative and commercial interests.

In the light of puzzling entanglements and the respective partiality of knowledge, this research aims to foster alternative understandings by providing a toolkit with manipulated measuring devices for the reconfiguration of meaning making drawing on the work of Karen Barad (2007). Her inquiry is associated with New Materialism, a material-semiotic approach focussing on physical, situational, implicit and per-formative qualities. Conventional measuring devices transformed as 'Tools for Alternative Understandings' were developed within this research under the postulate of 'Elastic Design'—a proposed extension of speculative design driven by the principle of elasticity as a thought-provoking strategy operating in a 'push-pull

dynamic' (Hayles, 2001). This productive interplay describes the search for enabling alternatives versus conceptual constraints motivated by certain claims, conditions or interests. The paper discusses elasticity within design and education by means of two exemplary tools—rearranged graph paper and manipulated spirit levels. Both devices are used within a pedagogical and constructional context explicating their reconfiguring capacity.

**Keywords:** Design, alternatives, materiality, hybridity, methodologies

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### ***Elastic Transformations within the Production of Knowledge through Art and Design***

Research and practice through art and design is generally situated within a larger context informed by cultural conditions, social structures and environmental constraints. Particularly design with its integrated approach takes different circumstances, conventions and perspectives into consideration with the aim to provide a resilient basis for exchange and communication. On the one side, design is motivated by the desire to communicate effectively across various concerns and challenges. On the other side, design is predominantly guided by notions of idealised simplicity and predictability. This attitude fosters a capitalist and competitive ideology that strives for streamlined feasibility and efficient profitability nurturing a culture of convenience and detachment.

In the light of current multilayered challenges and pressing issues that human kind is facing, such one-sided perspectives and benefit-driven approaches are extremely discouraging as they are incapable to account for the complexity of social, political, economic and environmental concerns. The design theorists and social planners Horst Rittel and Melvin Webber described such dilemmas as 'wicked problems' (1973) drawing attention to the emergent and intricate qualities of social reality. In contrast to the clearly definable issues of natural sciences and economy that may be approached with scientific rigour and calculating strategies, new ideas and means of advancement are required when tackling 'wicked' issues (not only from a design perspective). For example, climate change, infectious diseases or wealth inequality are normally dealt with emission standards, quarantine laws or indexes for social justice. But such conventional methods rule out differently informed advancements as they privilege a certain kind of cultural development assuming simple causality and efficient manageability. However, only a plurality of approaches and a mix of methodologies

stimulating inventive capabilities and alternative associations may foster more agile and imaginative responses to intricate realities. I argue that unconventional models of thought expand our human sensorium by promoting emancipated modes of understanding so that more viable futures beyond traditional agendas may be conceived.

Donna Haraway's concept of 'situated knowledges' (1988) helps to envision such different kinds of understanding. Haraway introduced the idea as an alternative objectivity being based on a partial perspective in opposition to positivist knowledge claims for universality and also relativist descriptions provided by postmodern movements. The contingency of 'situated knowledges' takes divergent aspects into account offering a multi-dimensional subjectivity. It is a different course of thought and meaning making that is actuated by the contradictions between various circumstances, viewpoints and paradigms. This progressive and dialectic instability mediates in-between a technological determinism of reductionist frameworks that are associated with Cartesian epistemology. It is a productive interplay that I describe with the words of Katherine Hayles as a 'push-pull dynamic', which offer 'enabling constraints' while creating leeway for alternative ideas and potentials (2001). Simple oppositions and absolute incongruity may be surpassed while intricate circumstances and ignored factors may be taken into account. It is an approach where different paradigms may merge to enhance each other mutually.



Figure 1: 'Elastic Design'—toolbox with 'Tools for Alternative Understandings', first prototype (Bettina Bruder, 2016).

Based on these considerations, I developed the idea of 'Elastic Design' (Bettina Bruder,

2016). This is a conceptual and methodological extension for speculative design using a material quality as visionary device. The interpretive principle of elasticity as a model of thought facilitated to think and work with and through contradictions while it also allowed the conceptualisation of change in order to explore alternative solutions for ideological predicaments. Vigour, adaptability and transformation are essential features of this basis.

Furthermore, the concept describes a resistant cohesion with the potential to collapse at any time and thus generate even more deviation, triggering a different course of events. The notion of elasticity suggests a resonant spectrum of possibilities that was employed as thought-provoking catalyst pervading the explorative approach of 'Elastic Design'. It also served as material and conceptual ingredient in the development of the practice-based component of this project, which comprises 'Tools for Alternative Understandings'—a playful, inspiring toolkit of reconfigured measuring devices and applications as shown in figure 1.

Eight experimental projects that were located in the field of metrology, the science of measurement, deployed the ideological tension between classical science versus unruly reality exemplifying their malleable materiality and reconfiguring capacity. In the course of the project, I developed several idiosyncratic measurement tools, applications and industry standards such as manipulated measuring tapes, irregular paper sizes deviating from ISO 216 specifications, deformed graph paper, erratic websites, peculiar processing software, shrunken measuring cups, viscous time keepers and organic spirit levels. The project started from the premise that alternative ways of measuring may stimulate a change in attitudes, values and behaviours.

The theoretical framework of 'Elastic Design' is based on New Materialism representing a material-semiotic approach that draws out the intertwinement between human and non-human agency being interacting constituents in the fabrication of reality. In drawing on Karen Barad's reconceptualisation of measurement through the indeterminacy found in quantum physics (2007), 'Tools for Alternative Understandings' provoke unconventional interpretations and models of thought generating divergent conceptions and different ways of engaging with the world.

The manipulated devices act as pedagogical and informative assets in order to reconfigure our encounters with reality.

The concept of material agency redirects our perception. Substances and devices are no longer passive objects. Instead, they reveal their dynamic and interventional quality generating a politically and ethically different infrastructure. Barad explains in an interview with

Rick Dolphijn and Iris van der Tuin the coactive open-endedness of material agency:

[A]gency is about response-ability, about the possibilities of mutual response, which is not to deny, but to attend to power imbalances. Agency is about possibilities for worldly reconfigurings. So agency is not something possessed by humans, or non-humans for that matter... It [agency] is an enactment. And it enlists, if you will, “non-humans” as well as “humans” (2012, 55).

My manipulated tools work with and through their material agency. Building on the concept of elasticity emphasizing transformability and adaptation, the reconfiguring potentials of the devices take effect. I present here two exemplary tools: manipulated graph paper called ‘Disorienting Descartes’ and transformed spirit levels named ‘Organic Equilibrium’. Both applications are used in the context of construction, measuring and learning. These analytical approaches aim for comparability, control and reproducibility while the manipulated counterparts interfere with traditional practices of measuring, indexing and representation.

### **Disorienting Descartes**

Normally, graph paper displays a regular grid of horizontal and vertical lines on a standard sheet of paper. Auxiliary lines allow the rectangular arrangement of visual information in an ordered Euclidian space following Cartesian logic. This consistent pattern facilitates the balanced organization of letters, figures and graphs in a linear and geometric fashion ruling out any visual inhomogeneity while supporting the streamlined and efficient representation of delineative elements. Lines and grids of graph paper are associated with the precision of engineering and construction establishing a space of regular order where forces and components within a respective task can be neatly aligned within a metric or imperial system furthering expedience, precision and clarity. This regulating functionality is undermined through the experimental graph paper of ‘Disorienting Descartes’ in three experiments.

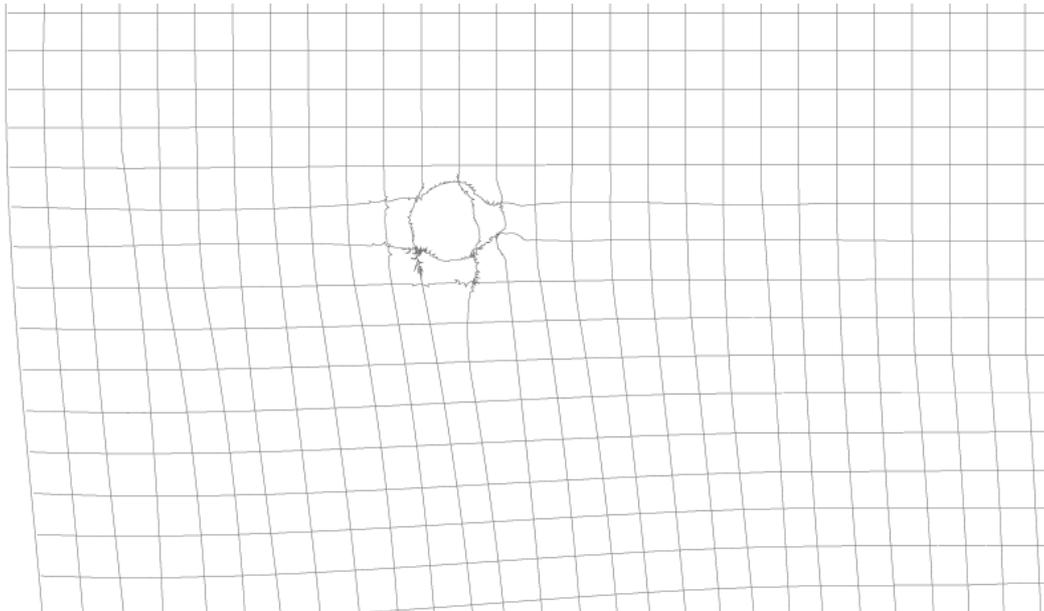


Figure 2: 'Disorienting Descartes', loopholes and twisted lines, detail (Bettina Bruder, 2016).

Firstly, I produced peculiar exercise books with irregular graph paper in the style of notebooks as they are commonly used in primary schools to learn mathematics and writing. In contrast to the regular squares of normal graph paper, the grid of 'Disorienting Descartes' exhibits slanted shapes and twisted lines so that loopholes and curly waves provide now the "structural" basis for letters, figures and diagrams as shown in figure 2. In a second execution, several regular notebooks were purchased from supermarkets. Some of the existing pages were replaced with the rearranged graph paper (see figure 3 and 4). These revamped exercise books were returned to the stationery section of the stores for their potential redistribution. The subtle modifications of the grids were discovered probably only accidentally when using the notebooks. But the faulty grids may have instigated an inspirational momentum of discovery interrupting a habitual process of thought.



Fig. 3, 4: 'Disorienting Descartes', notebooks in supermarket (Bettina Bruder, 2016).

The third execution was an online-application that allowed the production of manipulated graph paper through a user. Three different modes were offered—the subtle deformation, the partial elimination or the tilting of the lines as shown in figure 5 and 6. When saved as pdf, the reconfigured pattern could be printed and used as graph paper. Every interference with the grid impacted the regular structure in such a way that it bounced and gradually relaxed over time. Thus, the Cartesian grid turned into a responsive layer as a pedagogical incentive evoking different forms of engagement than the mechanised operations within a preconfigured framework. Now, a user was challenged to “read between the lines” and to “fill in the blanks” following a different model of thought.

Graph paper and exercise books were chosen for this research with the intention to interfere with conventional ways of learning linking materiality with meaning making. In an educational context, auxiliary lines facilitate to learn writing, reading and drawing. Following the lines of the grid, a student trains the coordinated movement of the hand in relation to cognitive and associative capabilities in order to identify interrelations and to draw conclusions. Motor skills and manual dexterity are linked with the processing and structuring of information such as the development of ideas and visual representations. Writing, drawing, reading and sketching are transformational operations where the bodily movement of eyes and hands is performed in relation to the production of signs and marks.

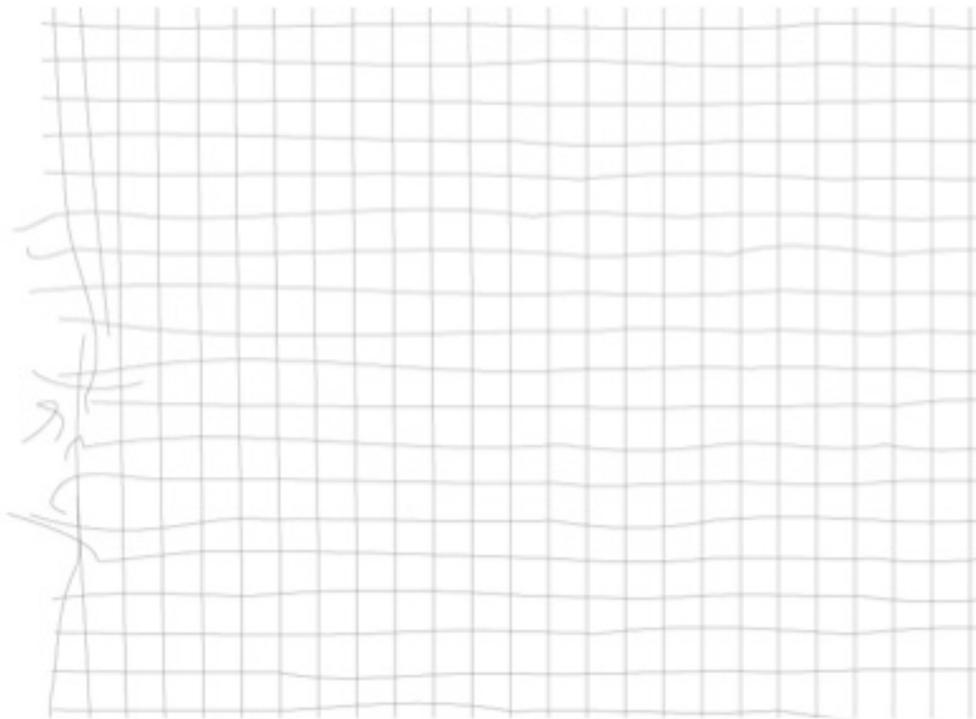


Fig. 5: ‘Disorienting Descartes’, partial elimination, detail (Bettina Bruder, 2016).

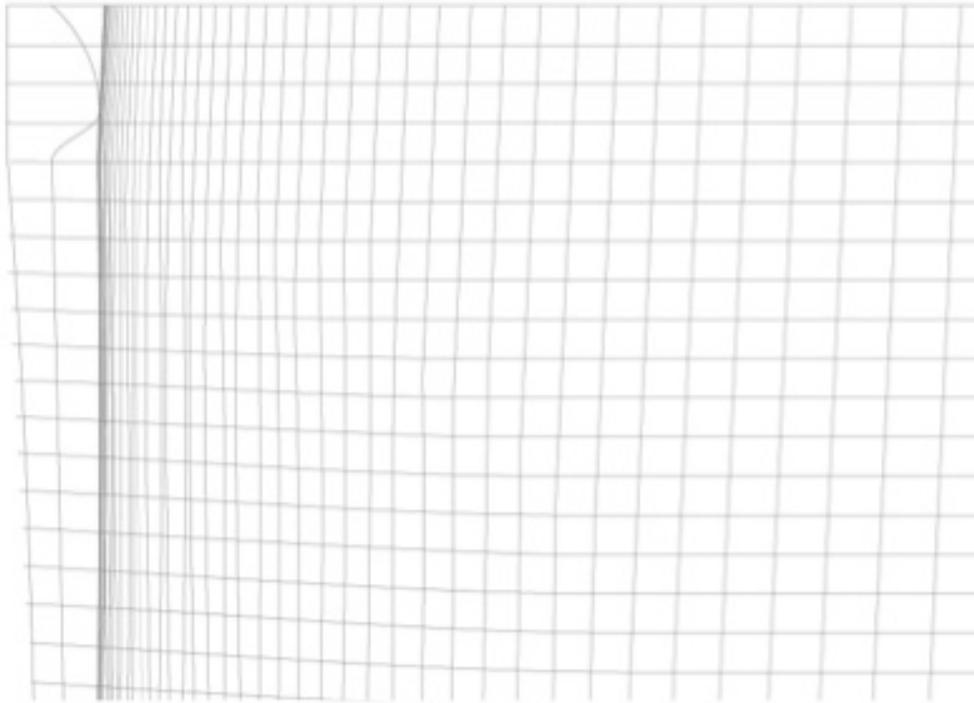


Fig. 6: 'Disorienting Descartes', tilted and skewed lines, detail (Bettina Bruder, 2016).

Using deformed graph paper such as 'Disorienting Descartes' enhances these processes of transformation that Bruno Latour and Steve Woolgar termed 'inscription' in reference to the conversion processes within scientific inquiries (1979). The practice of inscription describes the translation of material samples and organic matter into verifiable facts, diagrams and visualisations. It is a process that allows the communication of information while the notion of legibility, control and factual validity is facilitated. Technoscientific accuracy displayed in the form of grids and geometric letters discloses the constructedness of visualisations that promote factual argumentation and authoritative proficiency. In contrast, the curvy lines and faulty grids of 'Disorienting Descartes' subvert such prefabricated engagement with diagrams and visual representations.

The irregular graph paper of 'Disorienting Descartes' undermines the technical and intellectual constructability of knowledge. Cartesian epistemology associated with rational control, mathematical precision and technical efficiency is now destabilised and diluted. Such analytical approaches explicit in the notion of representationalism are criticised by Barad as culturally conditioned mental dispositions being 'part of Western's philosophy legacy' (2007, 49). It is a congealed mindset where only critical doubt may foster the development of alternative solutions. 'Disorienting Descartes' provokes such scepticism and asks for reconsideration by countering the pre-set dualism of Cartesian models of thought that imply the separability of the world into true or false with respective representations.

Such traditional approaches aim for the controllable arrangement of distinct marks and definable entities assuming direct causality and regular structures. The Cartesian method pursues linear and causal connections aiming for highest efficiency to avoid expensive adjustment, change and adaptation. Conversely, the irregular graph paper of 'Disorienting Descartes' challenges these oversimplifying approaches. The irregular grid requires a 'performative understanding'—a term used by Barad (2007, 49) to describe alternative practices in the production of knowledge as this kind of understanding is more agile and dexterous than conventional operations.

Concepts like 'performativity' and 'situated knowledges' are revolutionary drafts for alternative futures. These unconventional propositions explicated here by the irregular grids of 'Disorienting Descartes' draw attention to processual and experiential qualities within knowledge making practices. In contrast to reproducible conditions, the deformed graph paper stimulates an immediate, material and first-hand engagement with the world enabling experimental and provisional encounters.

Meaning making in that sense becomes an open-ended 'material-discursive practice' (Barad, 2007, 152) corrupting a target-driven approach based on pre-set routines and operations. The absoluteness of Cartesian validity striving for efficiency with clear-cut explanations and engineered precision is now dissolved turning ready-made ascriptions into contingent relations. Thus, the deranged construction lines may open up alternative compositions of reality while shifting economic and scientific default settings. More attention, time and care is required to account for the intricacies that emerge through the enriched perspectives and conditions.

### **Organic Equilibrium**

My second example, the modified spirit levels called 'Organic Equilibrium' (see figure 7) challenge the binarism of rectangularity that divides the world into perfectly flat planes and straight angles on the one side and uneven formations on the other. Normally, spirit levels are precision instruments that are deployed in industrial, scientific and medical settings providing consistent reference marks for control, efficient fabrication and precise orientation.

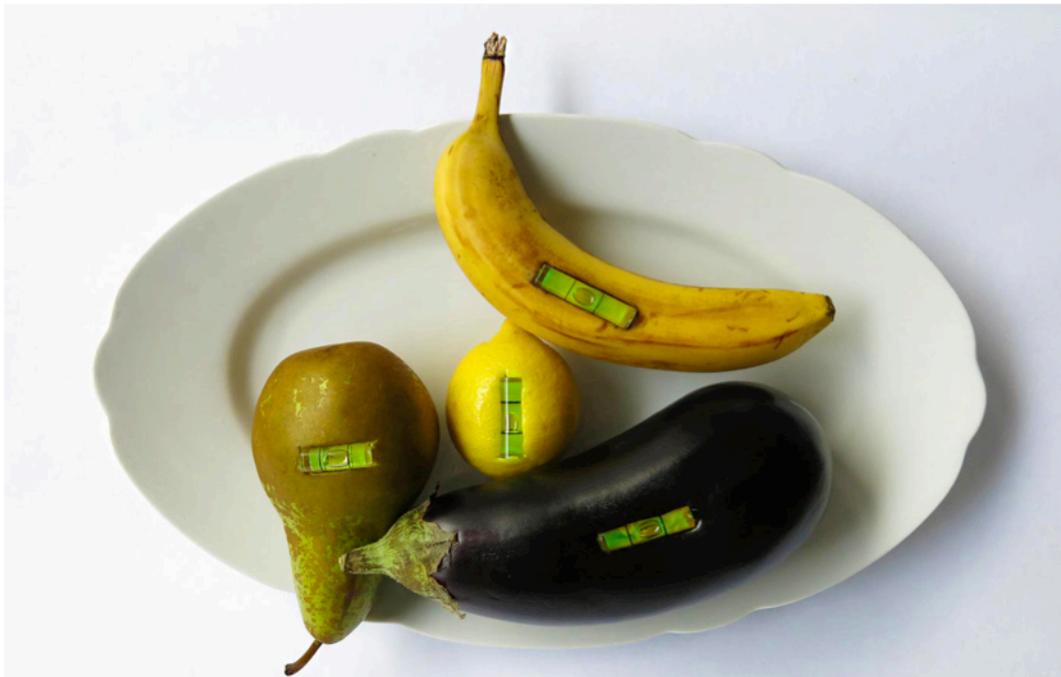


Fig. 7: Organic Equilibrium (Bettina Bruder, 2016).

In a symbolic reading, spirit levels and measuring scales represent the tension between competing concerns connoting themes of justice, discipline and agreement.

This notion of universal truth is now subverted by the manipulated spirit levels.

'Organic Equilibrium' is inspired by the work of photographer Kevin van Aelst's 'In Search of Perfect States' (2010). Ordinary off-the-shelf instruments were purchased in a hardware store. The spirit levels were disassembled and rearranged in order to interfere with their levelling mechanism (see figure 8). The vial comprises an air bubble that swims in liquid inside a small tube indicating perfect horizontality or verticality in specific positions. Enclosed in a robust, block-shaped housing, a spirit level enables the detection and production of straight surfaces and uniform shapes. Such standardised configurations offer increased stability and control—ultimately, these conditions are expedient for manufacture, storage and transportation in an industrial context.

In contrast to the robust housings, the vials of 'Organic Equilibrium' were embedded into organic materials, such as dough, frozen water or plants like fruits and vegetables (figure 9). These substances decompose, melt and transform. Thus, concepts of durability, accuracy and perfection were challenged through non-perpendicular results. Using Organic Equilibrium disappoints the expectation that objective solutions and streamlined outcomes could be maintained easily. Instead, reality may be negotiated differently and not only in boxes or rectangular shapes. Here, the material agency of the revamped devices became apparent in

the malleability of the deployed substances enhancing context-dependency while triggering more participative forms of engagement. I speak of participation as unreliable forces are usually excluded when measuring. Now, aspects like eventuality, unpredictability or preconceptions explicit in the form of gravity, decay or human involvement became active collaborators in the construction of reality.

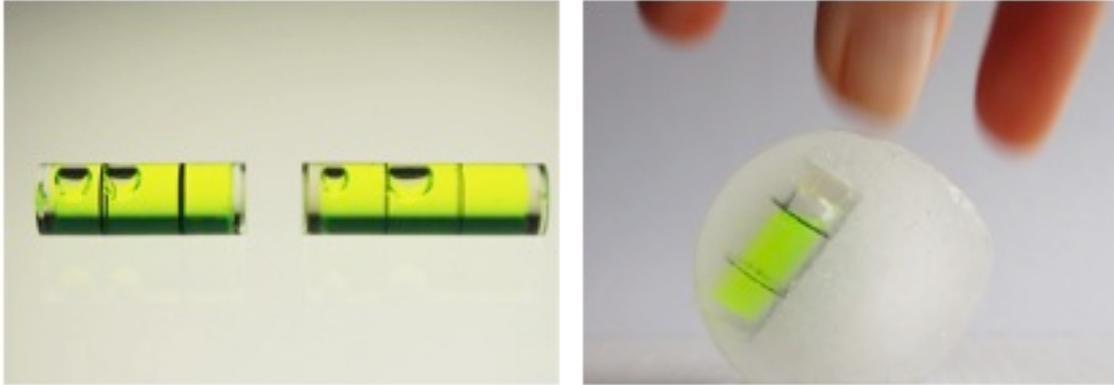


Fig. 8 and 9: Different tests with the vials of 'Organic Equilibrium' (Bettina Bruder, 2016).



Fig. 10: Organic Equilibrium, assisted (Bettina Bruder, 2016).

As shown for instance in figure 10, a manipulated spirit level in the form of a decomposing banana requires manual assistance through a hand (or any other kind of support) in order to keep a “balanced” position. This need for ongoing care and co-operation balancing out underprivileged, ignored and excluded aspects is now made accessible for renegotiation. By

using these reconfiguring devices, well-balanced stability and sound agreement are no longer a matter of durable and detached objectivity, but on the contrary, a question of dedicated concern, responsibility and sensitivity. Care and continued adjustment is required in order to account for the fragile linkages and hybrid complexities of current wicked challenges that are generally overlooked or rejected in systematised knowledge making practices.

## **Conclusion**

The concept of 'Elastic Design' explicated by the 'Tools for Alternative Understandings' demonstrates that the nature of knowledge and the quality of respective interpretations depends on the different models, paradigms and approaches that are applied in the practice of design and meaning making. The manipulated measurement devices take formal and structured ways of meaning making ad absurdum in a playful manner. Using the redesigned measurement tools provokes a hybridity of processes:

Firstly, the scope of action is expanded as experimental and provisional engagement within the production of knowledge is encouraged. Secondly, alternative viewpoints are introduced and provoked as formerly excluded forces and considerations such as contingency, impermanence and bias deflect the conventional course of action that usually privileges traditional agendas guided by economic profitability, technoscientific rationality and detached convenience. Thirdly, engaged, conditional and implicit encounters are promoted as inspirational impulses and pedagogical prompts instigating a change of procedures and perspectives. Thus, human and non-human factors are invited to become operant and effective within the production of knowledge.

In my current position as academic and practitioner, I deploy the concept of 'Elastic Design' and the 'Tools for Alternative Understandings' to inspire students and clients. The toys work as conversation starters reconfiguring processes of concept formation and construction in a material, physical and ideational sense as alternative scenarios and unconventional pathways for meaning making are generated. In the context of design and education, predetermined experiences and templated interpretations explicit in the agendas of science, technology, engineering and mathematics (STEM) are subverted. Instead, newly created learning scenarios are broadened so that unpredictable and non-linear narratives increase the need for communication and renegotiation triggering a shift in conventional modes of production, exchange and understanding. A dynamic learning process is eventuated based on the interplay of malleable materials, motor skills, intellect and intuition.

Ultimately, I hope that art and design adapt and revise existing agendas so that the 'wicked' challenges of today may be met more adequately. Such educational and provocative exercises will cultivate our sensitivity and readiness for change and collaboration.

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